

# **TYPHOON SIBYL (20W)**

## **I. HIGHLIGHTS**

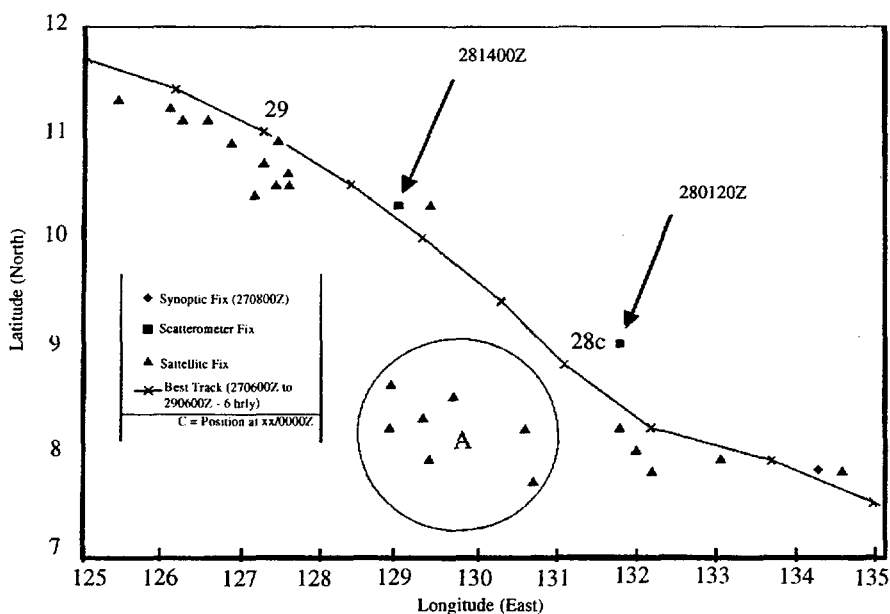
Scatterometer data from the ERS-1 satellite played an important role in tracking Sibyl while the system was poorly organized. Sibyl reached its peak intensity of 95 kt (49 m/sec) as it crossed the Visayan islands. Later, it tracked over metro-Manila and entered the South China Sea, where it slowly weakened before making landfall east of the Luichow peninsula in southern China.

## **II. TRACK AND INTENSITY**

The weak tropical disturbance that became Sibyl passed south of Majuro Atoll in the Marshall Islands late on 21 September and just south of Kosrae 24 hours later. Application of Dvorak's technique to the satellite imagery at 221130Z indicated that the system had developed sufficiently to be classified as a T 1.0 (equivalent to an intensity of 25 kt (13m/sec)). Based upon synoptic data and satellite intensity estimates, this tropical disturbance was first mentioned on the 230600Z Significant Tropical Weather Advisory. At 231200Z, the amount and organization of deep convection diminished, and no satellite classifications were made until 251700Z. Nevertheless, synoptic data and satellite imagery did indicate the continued westward movement of the poorly organized disturbance.

When the system began to develop, it did so at a very slow rate, and three Tropical Cyclone Formation Alerts were issued: the first at 252000Z, the second at 262000Z, and the third at 270600Z September. The latter was superseded when the JTWC issued the first warning on Tropical Depression 20W (TD 20W), valid at 280000Z. The slow development from the Marshall Islands to near 130°E is typical of La Niña (cold phase of ENSO) conditions as persistent low-level easterlies prevent the monsoon trough from extending into Micronesia.

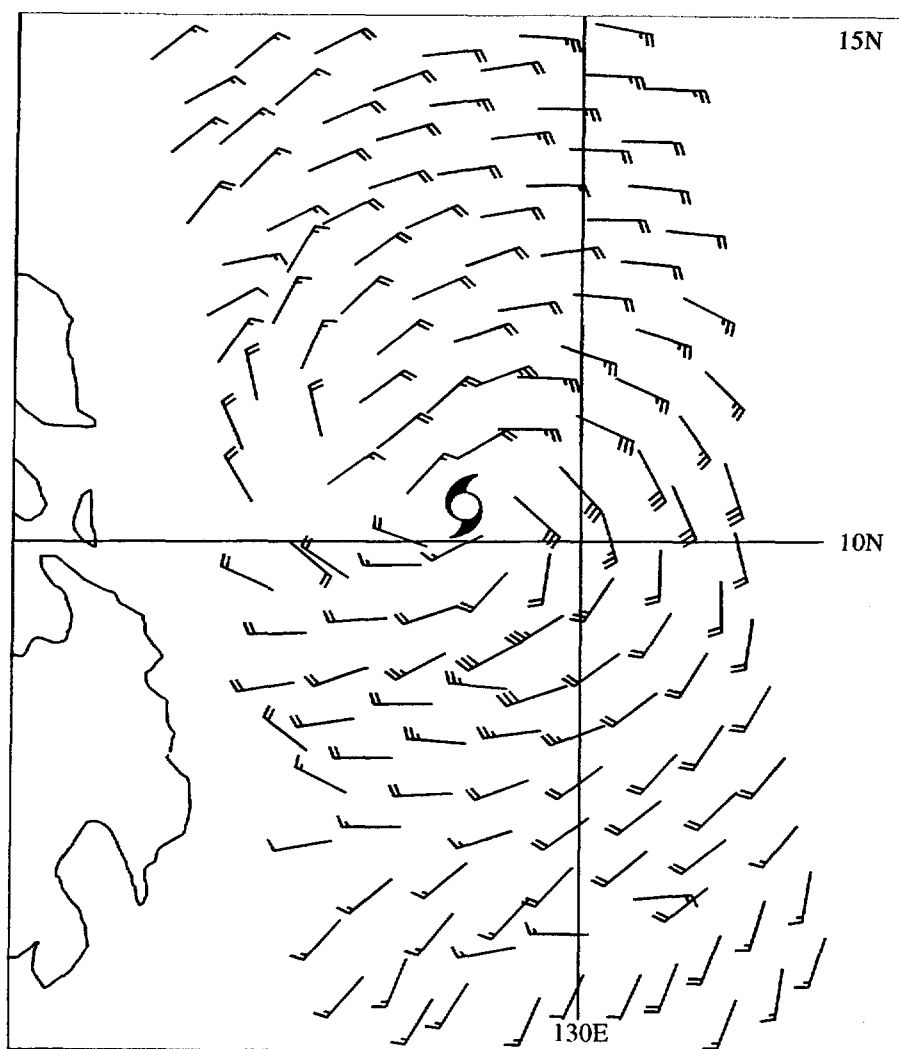
Poorly organized convection created working best track problems. For example, from 271800Z until 281130Z, satellite fixes following the deep convection, indicated continued westward movement (the cluster of fixes shown in area A on Figure 3-20-1). However, the low-level wind circulation tracked to the northwest, which was confirmed by two ERS-1 scatterometer passes (note the location of these two fixes on Figure 3-20-1). The differences between the fixes placed within the center of the deep convec-



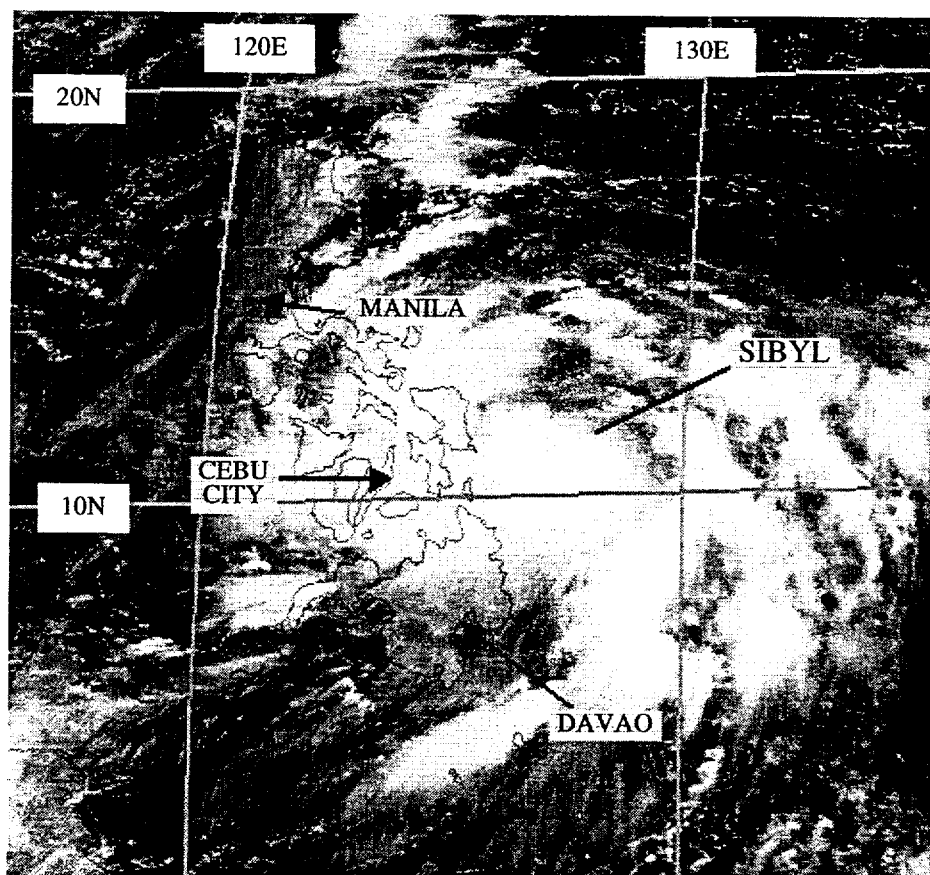
**Figure 3-20-1.** Display of weather satellite tropical cyclone fixes (triangles), ERS-1 scatterometer fixes (squares), a synoptic fix (diamond), and the best-track positions at 6-hour intervals for the pre-Sibyl tropical disturbance during the period 270600Z to 291200Z September. Note the cluster of satellite fixes in region A (enclosed by a circle) that are well south of the scatterometer fixes and the final best-track positions.

tion versus the wind center fixes based on the scatterometer data were as large as 120 nm (220 km). The 280120Z ERS-1 pass also showed that the system had intensified to 30 kt (15 m/sec) one-minute average (note: the scatterometer winds are considered to be representative of an eight-minute average 10-meter surface wind measurement). The scatterometer data from the ERS-1 pass at 281400Z indicated 35 kt (18 m/sec) maximum marine surface winds in the southeastern quadrant of a well-defined cyclonic circulation (Figure 3-20-2).

Based upon satellite intensity estimates, and scatterometer winds, TD 20W was upgraded to Tropical Storm Sibyl on the warning valid at 281800Z. Sibyl intensified as it neared the Philippines (Figure 3-20-3), and continued to intensify as it moved through the northern Visayan Islands. A minimum sea-level pressure of 977.9 mb was recorded at Tacloban (WMO 98550) at 290900Z. Sibyl attained typhoon intensity three hours later at 291200Z, and reached its peak intensity of 95 kt (49 m/sec) at 301200Z just before moving ashore in Luzon southeast of Manila (Figure 3-20-4). Possible mechanisms for intensification while crossing through an archipelago of high islands are outlined in the discussion section. Surface observations from the Philippines enabled the JTWC to make seven synoptic fixes that aided in tracking Sibyl.



**Figure 3-20-2** Scatterometer data from the ERS-1 spacecraft indicate that Sibyl has a well-defined cyclonic circulation in the low-level wind field and a maximum wind speed of 35 kt (17m/sec) (281400Z September ERS-1 scatterometer-derived marine surface winds).



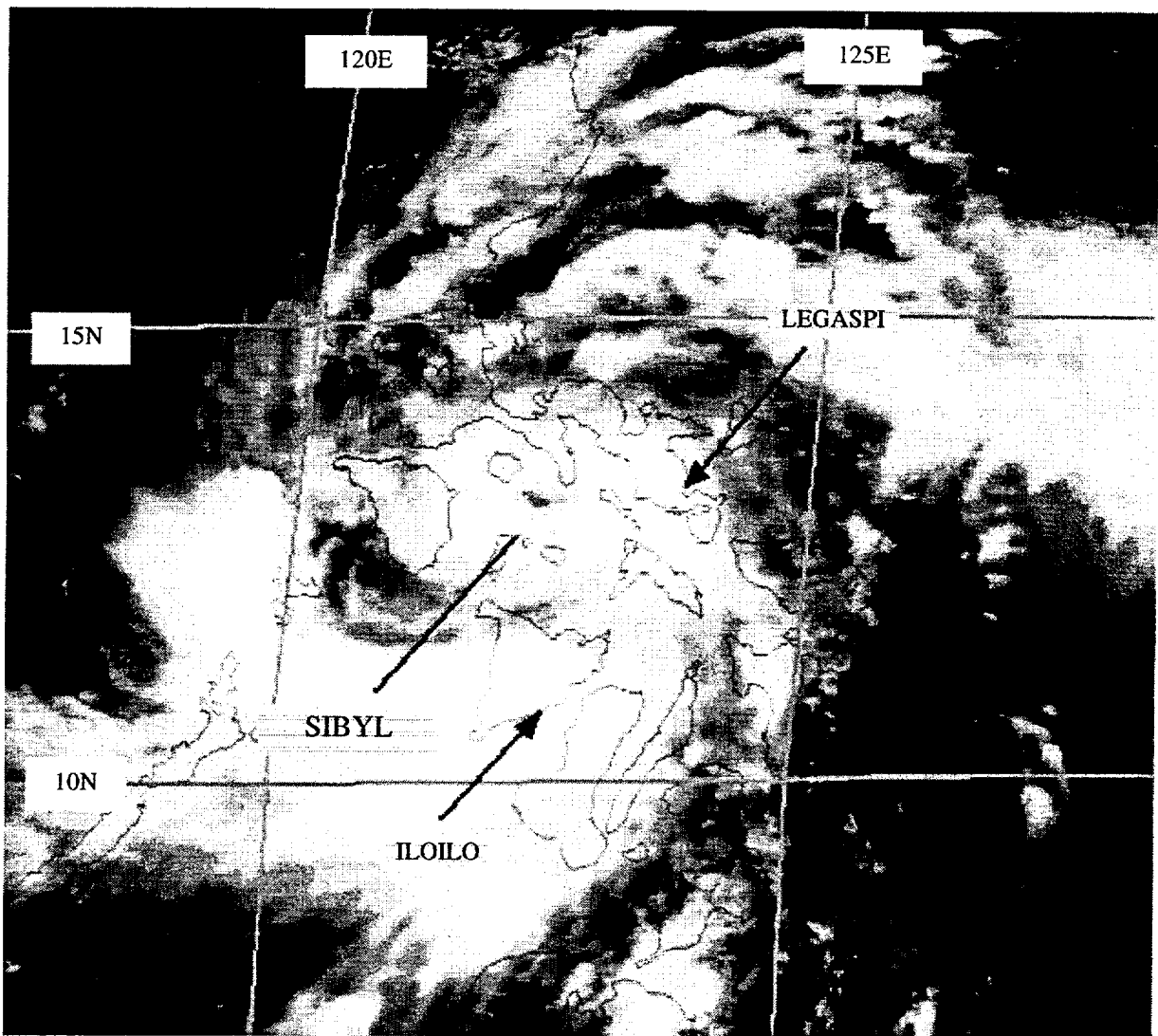
**Figure 3-20-3** Sibyl approaches the Philippines with an intensity of 45 kt (23 m/sec) (290031Z September visible GMS imagery).

By 301800Z, Sibyl had crossed most of metropolitan Manila. Data received after-the-fact from the Philippine Atmospheric, Geophysical, and Astronomical Services (PAGASA) indicated that Sangley Point (WMO 98428) recorded maximum 10-minute sustained winds of 65 kt (33 m/sec) at 301655Z. This converts to 75 kt (39 m/sec) 1-minute sustained wind speed. The typhoon exited the Philippines at 010000Z October and entered the South China Sea. Weakening over water in the South China Sea, Sibyl was downgraded to a tropical storm on the warning valid at 021800Z October. Making a gradual turn to the north, Sibyl made landfall at 030400Z about 175 nm (325 km) west-southwest of Hong Kong, where Waglan Island (WMO 45007) measured maximum sustained winds of 58 kt (30 m/sec) (one-minute average) with a peak gust of 62 kt (32 m/sec). Surface synoptic reports in China near Sibyl indicated that the low-level circulation dissipated on the morning of 04 October. The JTWC issued the final warning on Sibyl valid at 031800Z October.

### III. DISCUSSION

#### *Intensification while crossing the Philippines*

Although tropical cyclones usually weaken over land, those that cross through the Visayan region of the Philippines often intensify. The following discussion offers a hypothetical explanation of this phenomenon. The Visayan region of the Philippines is an archipelago of high islands with more of the area covered by water — very warm water — than by land. A tropical cyclone passing through this region may thus continue to derive energy through air-sea interaction. In addition, the mountainous islands of the archipelago and the southern part of Luzon (which forms a barrier on the northern side of the region) may act — through frictional effects and geographic barrier effects — to shrink the size of a tropical



**Figure 3-20-4.** Typhoon Sibyl a few hours before reaching its peak intensity of 95 kt (49 m/sec) when located about 125 nm (230 km) southeast of Manila (300331Z September visible GMS imagery).

cyclone entering the region. Low-level cyclonic winds are forced to accelerate through channels between the land areas, enhancing the low-level convergence. As long as upper-level flow patterns are favorable for intensification, the increased low-level convergence will lead to greater convection, and, as the wind field shrinks, the vorticity may become more concentrated toward the core or the tropical cyclone. As a result, intensification proceeds as the tropical cyclone passes through the archipelago.

#### IV. IMPACT

In the Philippines, Sibyl's passage resulted in at least 108 deaths and left 100 people missing. Fifty of the deaths occurred in the town of Cabalantian (50 nm (95 km) north of Manila) from floods and 18-foot high lahars (mudflows) from the slopes of Mount Pinatubo. Storm-related torrential rains and associated landslides caused fatalities and destruction of property as far as 500 nm (925 km ) south of Manila. In Manila, power was cut to thousands of people. Damage from Sibyl exceeded 1 billion pesos or US\$38.5 million. No reports of damage were received from China.